

## Claims

What is claimed is:

1. A packet flow control method for a switching node of a data transfer network, said method comprising:  
  
actively managing space allocations in a central queue for a plurality of ports of a switching node of a data transfer network; and  
  
wherein the actively managing is based on a variable amount of unused space available in the central queue.
2. The method of claim 1, wherein the unused space available in the central queue comprises vacated allocated space and unallocated space available in the central queue, and the actively managing further comprises separately tracking the vacated allocated space and the unallocated space currently available in the central queue.
3. The method of claim 1, wherein the unused space available in the central queue comprises unallocated space currently available in the central queue, wherein the actively managing further comprises offering a quantity of unallocated space currently available in the central queue to the plurality of ports according to a defined distribution rule.
4. The method of claim 1, wherein the unused space available in the central queue comprises vacated allocated space, and wherein the actively managing further comprises offering the vacated allocated space to a port to which the vacated allocated space is currently assigned.
5. The method of claim 1, wherein the actively managing further comprises allocating, by a port credit manager, an offered space to at least one virtual lane of a port based on a space need of the at least one virtual lane, the offered space comprising a quantity of unused space in the central queue.

6. The method of claim 5, wherein the quantity of unused space comprises at least one of a vacated allocated space currently assigned to the port and a quantity of unallocated space available in the central queue.

7. The method of claim 5, wherein the allocating further comprises determining the space need based on an amount of central-queue space borrowed by the at least one virtual lane, wherein the amount of central-queue space borrowed comprises an amount of space by which a space allocation in the central queue allotted to the at least one virtual lane exceeds a target allocation.

8. The method of claim 5, wherein the allocating further comprises determining the space need based on an amount of unused space remaining in a space allocation in the central queue allotted to the at least one virtual lane, wherein the amount of unused space remaining comprises an amount allotted to the at least one virtual lane, but currently not used to store a received data packet.

9. The method of claim 5, wherein the allocating further comprises:

(i) reckoning an amount of central-queue space borrowed by the at least one virtual lane, wherein the amount of central-queue space borrowed comprises an amount of space by which a space allocation in the central queue allotted to the at least one virtual lane exceeds a target allocation; and

(ii) reckoning an amount of unused space remaining in the space allocation in the central queue allotted to the at least one virtual lane, wherein the amount of unused space remaining comprises an amount allotted to the at least one virtual lane, but currently not used to store a received data packet.

10. The method of claim 9, wherein the allocating further comprises reducing the amount of central-queue space borrowed and, with a remaining offered space, if any, increasing the amount of unused space remaining in the space allocation in the central queue allotted to the at least one virtual lane up to a desired amount, wherein the remaining offered space comprises the offered space not allotted by the input port credit manager for the reducing.

11. The method of claim 5, wherein the actively managing further comprises returning a balance of the offered space not allotted by the allocating back to the central queue.

12. The method of claim 11, wherein the actively managing further comprises adding the balance of the offered space returned by the port credit manager to the unallocated space available in the central queue.

13. A packet flow control system for a switching node of a data transfer network, said system comprising:

means for actively managing space allocations in a central queue for a plurality of ports of a switching node of a data transfer network; and

wherein the actively managing is based on a variable amount of unused space available in the central queue.

14. The system of claim 13, wherein the unused space available in the central queue comprises vacated allocated space and unallocated space available in the central queue, and the means for actively managing further comprises means for separately tracking the vacated allocated space and the unallocated space currently available in the central queue.

15. The system of claim 13, wherein the unused space available in the central queue comprises unallocated space currently available in the central queue, wherein the means for actively managing further comprises means for offering a quantity of unallocated space currently available in the central queue to the plurality of ports according to a defined distribution rule.

16. The system of claim 13, wherein the unused space available in the central queue comprises vacated allocated space, and wherein the means for actively managing further comprises means for offering the vacated allocated space to a port to which the vacated allocated space is currently assigned.

17. The system of claim 13, wherein the means for actively managing further comprises means for allocating an offered space to at least one virtual lane of a port based on a space need of the at least one virtual lane, the offered space comprising a quantity of unused space in the central queue.

18. The system of claim 17, wherein the quantity of unused space comprises at least one of a vacated allocated space currently assigned to the port and a quantity of unallocated space available in the central queue.

19. The system of claim 17, wherein the means for allocating further comprises means for determining the space need based on an amount of central-queue space borrowed by the at least one virtual lane, wherein the amount of central-queue space borrowed comprises an amount of space by which a space allocation in the central queue allotted to the at least one virtual lane exceeds a target allocation.

20. The system of claim 17, wherein the means for allocating further comprises means for determining the space need based on an amount of unused space remaining in a space allocation in the central queue allotted to the at least one virtual lane, wherein the amount of unused space remaining comprises an amount allotted to the at least one virtual lane, but currently not used to store a received data packet.

21. The system of claim 17, wherein the means for allocating further comprises:

(i) means for reckoning an amount of central-queue space borrowed by the at least one virtual lane, wherein the amount of central-queue space borrowed comprises an amount of space by which a space allocation in the central queue allotted to the at least one virtual lane exceeds a target allocation; and

(ii) means for reckoning an amount of unused space remaining in the space allocation in the central queue allotted to the at least one virtual lane, wherein the amount of unused space remaining comprises an amount allotted to the at least one virtual lane, but currently not used to store a received data packet.

22. The system of claim 21, wherein the means for allocating further comprises:

means for reducing the amount of central-queue space borrowed; and

means for increasing the amount of unused space remaining in the space allocation in the central queue allotted to the at least one virtual lane up to a desired amount with a remaining offered space, if any, wherein the remaining offered space comprises the offered space not allotted by the means for reducing to reduce the amount of central-queue space borrowed.

23. The system of claim 17, wherein the means for actively managing further comprises means for returning a balance of the offered space not allotted by means for the allocating back to the central queue.

24. The system of claim 23, wherein the means for actively managing further comprises means for adding the balance of the offered space returned by the means for returning to the unallocated space available in the central queue.

25. A queue manager for a switching node of a data transfer network, said queue manager comprising:

central queue control logic for a switching node for tracking a variable amount of unused space in a central queue of the switching node and offering a quantity of the unused space to a plurality of ports of the switching node; and

a port credit manager for allocating an offered space to at least one virtual lane of a port of the plurality of ports, the offered space comprising the quantity of the unused space in the central queue offered by said central queue control logic.

26. The queue manager of claim 25, wherein the unused space in the central queue comprises vacated allocated space and unallocated space available in the central queue; the central queue control logic separately tracks the vacated allocated space and the unallocated space; and the port credit manager further comprises a plurality of virtual lane credit calculators, each of the virtual lane calculators:

(i) reckoning an amount of central-queue space borrowed by a virtual lane of the port, wherein the amount of central-queue space borrowed comprises an amount of space by which a space allocation in the central queue allotted to the virtual lane exceeds a target allocation; and

(ii) reckoning an amount of unused space remaining in the space allocation in the central queue allotted to the virtual lane, wherein the amount of unused space remaining comprises an amount allotted to the virtual lane, but currently not used to store a received data packet.

27. The queue manager of claim 26, wherein each of the virtual lane calculators determines an amount of surplus space from the offered space to return to the unallocated space available in a central queue.

28. A switching node for a data transfer network, said switching node comprising:

a plurality of data ports;

a central queue for buffering data packets received by said plurality of data ports; and

a packet flow controller, wherein said packet flow controller actively manages space allocations in said central queue for said plurality of ports based on a variable amount of unused space available in said central queue.



29. At least one program storage device readable by a machine embodying at least one program of instructions executable by the machine to perform a packet flow control method for a switching node of a data transfer network, said method comprising:

actively managing space allocations in a central queue for a plurality of ports of a switching node of a data transfer network; and

wherein the actively managing is based on a variable amount of unused space available in the central queue.

30. The at least one program storage device of claim 29, wherein the unused space available in the central queue comprises vacated allocated space and unallocated space available in the central queue, and the actively managing further comprises separately tracking the vacated allocated space and the unallocated space currently available in the central queue.

31. The at least one program storage device of claim 29, wherein the unused space available in the central queue comprises unallocated space currently available in the central queue, wherein the actively managing further comprises offering a quantity of unallocated space currently available in the central queue to the plurality of ports according to a defined distribution rule.

32. The at least one program storage device of claim 29, wherein the unused space available in the central queue comprises vacated allocated space, and wherein the actively managing further comprises offering the vacated allocated space to a port to which the vacated allocated space is currently assigned.

33. The at least one program storage device of claim 29, wherein the actively managing further comprises allocating, by a port credit manager, an offered space to at least one virtual lane of a port based on a space need of the at least one virtual lane, the offered space comprising a quantity of unused space in the central queue.

34. The at least one program storage device of claim 33, wherein the quantity of unused space comprises at least one of a vacated allocated space currently assigned to the port and a quantity of unallocated space available in the central queue.

35. The at least one program storage device of claim 33, wherein the allocating further comprises determining the space need based on an amount of central-queue space borrowed by the at least one virtual lane, wherein the amount of central-queue space borrowed comprises an amount of space by which a space allocation in the central queue allotted to the at least one virtual lane exceeds a target allocation.

36. The at least one program storage device of claim 33, wherein the allocating further comprises determining the space need based on an amount of unused space remaining in a space allocation in the central queue allotted to the at least one virtual lane, wherein the amount of unused space remaining comprises an amount allotted to the at least one virtual lane, but currently not used to store a received data packet.

37. The at least one program storage device of claim 33, wherein the actively managing further comprises returning a balance of the offered space not allotted by the allocating back to the central queue, and the allocating further comprises:

(i) reckoning an amount of central-queue space borrowed by the at least one virtual lane, wherein the amount of central-queue space borrowed comprises an amount of space by which a space allocation in the central queue allotted to the at least one virtual lane exceeds a target allocation; and

(ii) reckoning an amount of unused space remaining in the space allocation in the central queue allotted to the at least one virtual lane, wherein the amount of unused space remaining comprises an amount allotted to the at least one virtual lane, but currently not used to store a received data packet.

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